

50Ω Bi-Phase 2 to 400 MHz

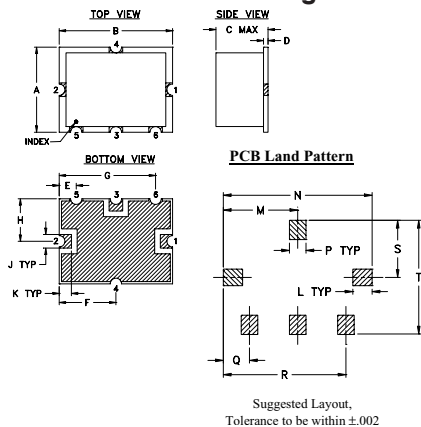
## Maximum Ratings

|                                                                 |                |
|-----------------------------------------------------------------|----------------|
| Operating Temperature                                           | -40°C to 85°C  |
| Storage Temperature                                             | -55°C to 100°C |
| Control Current                                                 | 30mA           |
| Permanent damage may occur if any of these limits are exceeded. |                |

## Pin Connections

|         |       |
|---------|-------|
| INPUT   | 1     |
| OUTPUT  | 2     |
| CONTROL | 3     |
| GROUND  | 4,5,6 |

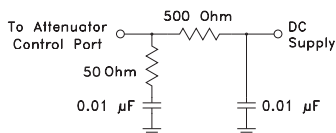
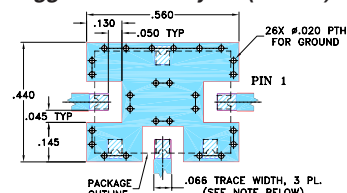
## Outline Drawing



## Outline Dimensions (inch)

| A    | B     | C     | D    | E    | F     | G     | H     | J     | K    |
|------|-------|-------|------|------|-------|-------|-------|-------|------|
| .38  | .50   | .23   | .020 | .075 | .250  | .425  | .187  | .050  | .050 |
| 9.65 | 12.70 | 5.84  | 0.51 | 1.91 | 6.35  | 10.80 | 4.75  | 1.27  | 1.27 |
| L    | M     | N     | P    | Q    | R     | S     | T     | wt.   |      |
| .070 | .270  | .540  | .060 | .095 | .445  | .208  | .415  | grams |      |
| 1.78 | 6.86  | 13.72 | 1.52 | 2.41 | 11.30 | 5.28  | 10.54 | 0.8   |      |

## suggested control port biasing configuration

Demo Board MCL P/N: TB-12  
Suggested PCB Layout (PL-079)

## NOTE:

- TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030" ± .002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
  - THE USE OF SOLDER MASK OVER THE GROUND AREA UNDER THE UNIT AS SHOWN IS RECOMMENDED TO PREVENT POTENTIAL SHORTING. IF USER CHOOSES TO EXPOSE METAL UNDER THE ENTIRE UNIT GROUND PAD FOR IMPROVED GROUNDING, IT IS RECOMMENDED A SOLDER MASK DAM BE APPLIED AROUND EACH GROUND PAD TO ENSURE TILLET AND CONNECTION AT GROUND PADS.
  - BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
- DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER), SEE NOTE 2.

## Notes

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuits' applicable established test performance criteria and measurement instructions.
- C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at [www.minicircuits.com/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)

## Features

- low conversion loss, 1.6 dB typ.
- excellent amplitude and phase unbalance

## Applications

- electronic attenuator



CASE STYLE: TTT166

## Attenuator/Switch Electrical Specifications

| FREQUENCY<br>(MHz) |         | INSERTION LOSS<br>(dB)<br>±20 mA |      | MAX. INPUT<br>PWR<br>(dBm)<br>±20 mA |      | IN-OUT<br>ISOLATION<br>(dB)<br>0 mA |              |      |      |      |      | BI-PHASE $\bar{X}$<br>(±20 mA) Typ. |      |                      |                                     |     |                |
|--------------------|---------|----------------------------------|------|--------------------------------------|------|-------------------------------------|--------------|------|------|------|------|-------------------------------------|------|----------------------|-------------------------------------|-----|----------------|
| IN                 | CON     | Mid-Band<br>m                    |      | Total<br>Range                       |      | 1 dB<br>compr.                      | no<br>damage | L    |      | M    |      | U                                   |      | $\Delta$ AMP<br>(dB) | Phase (deg.)<br>deviation from 180° |     |                |
| $f_L$ - $f_U$      |         | Typ.                             | Max. | Typ.                                 | Max. |                                     |              | Typ. | Min. | Typ. | Min. | Typ.                                | Min. | m                    | Total<br>Range                      | m   | Total<br>Range |
| 2-400              | DC-0.05 | 1.4                              | 2.0  | 1.6                                  | 3.0  | 20*                                 | 25           | 65   | 45   | 45   | 33   | 35                                  | 25   | 0.1                  | 0.1                                 | 1.0 | 2.0            |

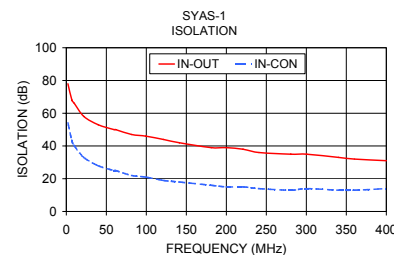
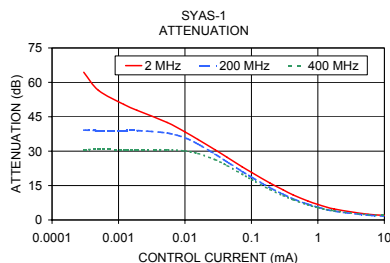
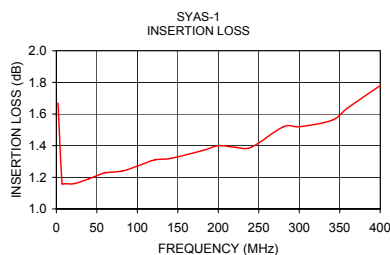
L = low range [f<sub>L</sub> to 10 f<sub>L</sub>] M = mid range [10 f<sub>L</sub> to f<sub>U</sub>/2] U = upper range [f<sub>U</sub>/2 to f<sub>U</sub>] m = [2 f<sub>L</sub> to f<sub>U</sub>/2]

\* 15 dBm from 2-10 MHz.

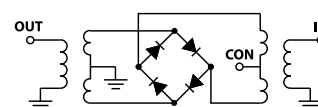
Performance specifications apply for input power up to 10 dB below stated 1 dB compression.

## Typical Performance Data

| Freq.<br>(MHz) | I. Loss<br>(dB)<br>at 20mA |          | ±Control<br>ΔAMP<br>(dB) | 20mA<br>ΔPhase<br>(deg.) | Isolation (dB)<br>(in-out) (in-con) |           | Input<br>R. Loss<br>(dB) | Control<br>Current<br>(mA) | Attenuation (dB) |            |            | Phase Δ ref at 15mA Ctrl |            |            | Input VSWR |            |            |
|----------------|----------------------------|----------|--------------------------|--------------------------|-------------------------------------|-----------|--------------------------|----------------------------|------------------|------------|------------|--------------------------|------------|------------|------------|------------|------------|
|                |                            |          |                          |                          |                                     |           |                          |                            | 2<br>MHz         | 200<br>MHz | 400<br>MHz | 2<br>MHz                 | 200<br>MHz | 400<br>MHz | 2<br>MHz   | 200<br>MHz | 400<br>MHz |
|                | $\bar{x}$                  | $\sigma$ | $\bar{x}$                | $\bar{x}$                | $\bar{x}$                           | $\bar{x}$ | $\bar{x}$                |                            |                  |            |            | deg.                     | deg.       | deg.       |            |            |            |
| 2.0            | 1.67                       | 0.000    | 0.01                     | 179.9                    | 78                                  | 54        | 18.1                     | 0.0000                     | 72.7             | 39.0       | 30.6       | 27.2                     | -87.7      | -95.3      | 7.7        | 7.2        | 4.4        |
| 7.0            | 1.16                       | 0.001    | 0.00                     | 180.0                    | 68                                  | 43        | 15.4                     | 0.0003                     | 64.4             | 39.2       | 30.7       | 22.2                     | -86.0      | -94.6      | 7.7        | 7.2        | 4.4        |
| 10.0           | 1.16                       | 0.001    | 0.00                     | 180.0                    | 66                                  | 40        | 27.6                     | 0.0005                     | 56.5             | 39.0       | 30.8       | 28.6                     | -84.3      | -93.7      | 7.6        | 7.2        | 4.4        |
| 21.9           | 1.16                       | 0.001    | 0.00                     | 180.0                    | 58                                  | 33        | 31.0                     | 0.0012                     | 50.4             | 39.0       | 30.7       | 17.6                     | -80.5      | -92.0      | 7.6        | 7.2        | 4.4        |
| 39.8           | 1.19                       | 0.001    | 0.00                     | 180.1                    | 53                                  | 28        | 31.9                     | 0.0019                     | 47.8             | 39.0       | 30.7       | 14.1                     | -77.4      | -90.3      | 7.5        | 7.2        | 4.4        |
| 59.7           | 1.23                       | 0.001    | 0.00                     | 180.1                    | 50                                  | 25        | 32.1                     | 0.0054                     | 42.5             | 37.9       | 30.6       | 8.2                      | -56.2      | -79.9      | 7.4        | 7.0        | 4.3        |
| 61.7           | 1.23                       | 0.001    | 0.00                     | 180.1                    | 50                                  | 25        | 32.1                     | 0.0100                     | 38.4             | 35.8       | 30.1       | 7.6                      | -37.3      | -67.6      | 7.2        | 6.9        | 4.3        |
| 81.6           | 1.24                       | 0.001    | 0.00                     | 180.2                    | 47                                  | 22        | 32.2                     | 0.0157                     | 35.1             | 33.1       | 29.0       | 8.8                      | -25.3      | -55.1      | 7.1        | 6.7        | 4.2        |
| 99.5           | 1.27                       | 0.001    | 0.00                     | 180.2                    | 46                                  | 21        | 32.3                     | 0.0284                     | 30.6             | 28.7       | 26.3       | 8.8                      | -12.8      | -37.6      | 6.7        | 6.3        | 4.0        |
| 121.4          | 1.31                       | 0.001    | 0.01                     | 180.3                    | 44                                  | 19        | 32.4                     | 0.0433                     | 27.3             | 25.3       | 23.7       | 9.2                      | -7.2       | -26.9      | 6.3        | 5.9        | 3.8        |
| 141.3          | 1.32                       | 0.001    | 0.01                     | 180.4                    | 42                                  | 18        | 32.4                     | 0.0722                     | 23.2             | 21.2       | 20.0       | 9.3                      | -3.1       | -17.7      | 5.6        | 5.3        | 3.5        |
| 181.1          | 1.37                       | 0.001    | 0.01                     | 180.6                    | 39                                  | 16        | 32.2                     | 0.1012                     | 20.7             | 18.6       | 17.6       | 9.0                      | -1.4       | -13.2      | 5.2        | 4.9        | 3.3        |
| 200.0          | 1.40                       | 0.001    | 0.01                     | 180.6                    | 39                                  | 15        | 32.0                     | 0.1898                     | 16.1             | 14.1       | 13.3       | 8.2                      | 0.4        | -8.0       | 4.1        | 3.9        | 2.8        |
| 220.9          | 1.39                       | 0.001    | 0.01                     | 180.8                    | 38                                  | 15        | 31.6                     | 0.3008                     | 13.1             | 11.2       | 10.6       | 7.4                      | 0.9        | -5.5       | 3.4        | 3.2        | 2.4        |
| 240.8          | 1.39                       | 0.001    | 0.01                     | 180.9                    | 36                                  | 14        | 30.3                     | 0.4259                     | 10.9             | 9.2        | 8.8        | 6.7                      | 1.1        | -4.2       | 2.9        | 2.7        | 2.1        |
| 280.6          | 1.52                       | 0.001    | 0.05                     | 181.1                    | 35                                  | 13        | 26.6                     | 0.7017                     | 8.3              | 6.9        | 6.6        | 5.4                      | 1.1        | -2.8       | 2.2        | 2.1        | 1.7        |
| 300.5          | 1.52                       | 0.001    | 0.04                     | 181.1                    | 35                                  | 14        | 24.8                     | 0.9968                     | 6.8              | 5.6        | 5.4        | 4.4                      | 0.9        | -2.1       | 1.9        | 1.8        | 1.5        |
| 340.3          | 1.56                       | 0.001    | 0.03                     | 181.4                    | 33                                  | 13        | 21.4                     | 1.7486                     | 4.8              | 3.9        | 4.0        | 3.0                      | 0.7        | -1.3       | 1.5        | 1.5        | 1.3        |
| 360.2          | 1.64                       | 0.002    | 0.06                     | 181.6                    | 32                                  | 13        | 19.8                     | 5.6920                     | 2.5              | 2.1        | 2.3        | 0.9                      | 0.2        | -0.3       | 1.2        | 1.1        | 1.2        |
| 400.0          | 1.78                       | 0.003    | 0.09                     | 181.7                    | 31                                  | 14        | 17.1                     | 15.1258                    | 1.8              | 1.5        | 1.8        | 0.0                      | 0.0        | 0.1        | 1.3        | 1.1        | 1.3        |



## electrical schematic



# Attenuator/Switch

SYAS-1

## Typical Performance Data

| FREQ.<br>(MHz) | INSERTION<br>LOSS<br>(dB)<br>at 20mA<br>Control<br>Current | AMP.<br>UNBAL.<br>(dB)<br>at $\pm 20$ mA<br>Control<br>Current | PHASE<br>UNBAL.<br>(deg.)<br>at $\pm 20$ mA<br>Control<br>Current | ISOLATION<br>at 0 mA<br>Control Current<br>(dB) |        | RETURN<br>LOSS<br>(dB)<br>Input |
|----------------|------------------------------------------------------------|----------------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------|--------|---------------------------------|
|                |                                                            |                                                                |                                                                   | In-Out                                          | In-Con |                                 |
| 2.0            | 1.67                                                       | 0.01                                                           | 179.9                                                             | 78                                              | 54     | 18.1                            |
| 7.0            | 1.16                                                       | 0.00                                                           | 180.0                                                             | 68                                              | 43     | 15.4                            |
| 10.0           | 1.16                                                       | 0.00                                                           | 180.0                                                             | 66                                              | 40     | 27.6                            |
| 21.9           | 1.16                                                       | 0.00                                                           | 180.0                                                             | 58                                              | 33     | 31.0                            |
| 39.8           | 1.19                                                       | 0.00                                                           | 180.1                                                             | 53                                              | 28     | 31.9                            |
| 59.7           | 1.23                                                       | 0.00                                                           | 180.1                                                             | 50                                              | 25     | 32.1                            |
| 61.7           | 1.23                                                       | 0.00                                                           | 180.1                                                             | 50                                              | 25     | 32.1                            |
| 81.6           | 1.24                                                       | 0.00                                                           | 180.2                                                             | 47                                              | 22     | 32.2                            |
| 99.5           | 1.27                                                       | 0.00                                                           | 180.2                                                             | 46                                              | 21     | 32.3                            |
| 121.4          | 1.31                                                       | 0.01                                                           | 180.3                                                             | 44                                              | 19     | 32.4                            |
| 141.3          | 1.32                                                       | 0.01                                                           | 180.4                                                             | 42                                              | 18     | 32.4                            |
| 181.1          | 1.37                                                       | 0.01                                                           | 180.6                                                             | 39                                              | 16     | 32.2                            |
| 200.0          | 1.40                                                       | 0.01                                                           | 180.6                                                             | 39                                              | 15     | 32.0                            |
| 220.9          | 1.39                                                       | 0.01                                                           | 180.8                                                             | 38                                              | 15     | 31.6                            |
| 240.8          | 1.39                                                       | 0.01                                                           | 180.9                                                             | 36                                              | 14     | 30.3                            |
| 280.6          | 1.52                                                       | 0.05                                                           | 181.1                                                             | 35                                              | 13     | 26.6                            |
| 300.5          | 1.52                                                       | 0.04                                                           | 181.1                                                             | 35                                              | 14     | 24.8                            |
| 340.3          | 1.56                                                       | 0.03                                                           | 181.4                                                             | 33                                              | 13     | 21.4                            |
| 360.2          | 1.64                                                       | 0.06                                                           | 181.6                                                             | 32                                              | 13     | 19.8                            |
| 400.0          | 1.78                                                       | 0.09                                                           | 181.7                                                             | 31                                              | 14     | 17.1                            |

| CONTROL<br>CURRENT<br>(mA) | ATTENUATION<br>(dB) |         |         | PHASE UNBALANCE<br>REF AT 15 mA CONTROL<br>(deg.) |         |         | INPUT VSWR<br>(:1) |         |         |
|----------------------------|---------------------|---------|---------|---------------------------------------------------|---------|---------|--------------------|---------|---------|
|                            | 2 MHz               | 200 MHz | 400 MHz | 2 MHz                                             | 200 MHz | 400 MHz | 2 MHz              | 200 MHz | 400 MHz |
| 0.0000                     | 72.7                | 39.0    | 30.6    | 27.2                                              | -87.7   | -95.3   | 7.7                | 7.2     | 4.4     |
| 0.0003                     | 64.4                | 39.2    | 30.7    | 22.2                                              | -86.0   | -94.6   | 7.7                | 7.2     | 4.4     |
| 0.0005                     | 56.5                | 39.0    | 30.8    | 28.6                                              | -84.3   | -93.7   | 7.6                | 7.2     | 4.4     |
| 0.0012                     | 50.4                | 39.0    | 30.7    | 17.6                                              | -80.5   | -92.0   | 7.6                | 7.2     | 4.4     |
| 0.0019                     | 47.8                | 39.0    | 30.7    | 14.1                                              | -77.4   | -90.3   | 7.5                | 7.2     | 4.4     |
| 0.0054                     | 42.5                | 37.9    | 30.6    | 8.2                                               | -56.2   | -79.9   | 7.4                | 7.0     | 4.3     |
| 0.0100                     | 38.4                | 35.8    | 30.1    | 7.6                                               | -37.3   | -67.6   | 7.2                | 6.9     | 4.3     |
| 0.0157                     | 35.1                | 33.1    | 29.0    | 8.8                                               | -25.3   | -55.1   | 7.1                | 6.7     | 4.2     |
| 0.0284                     | 30.6                | 28.7    | 26.3    | 8.8                                               | -12.8   | -37.6   | 6.7                | 6.3     | 4.0     |
| 0.0433                     | 27.3                | 25.3    | 23.7    | 9.2                                               | -7.2    | -26.9   | 6.3                | 5.9     | 3.8     |
| 0.0722                     | 23.2                | 21.2    | 20.0    | 9.3                                               | -3.1    | -17.7   | 5.6                | 5.3     | 3.5     |
| 0.1012                     | 20.7                | 18.6    | 17.6    | 9.0                                               | -1.4    | -13.2   | 5.2                | 4.9     | 3.3     |
| 0.1898                     | 16.1                | 14.1    | 13.3    | 8.2                                               | 0.4     | -8.0    | 4.1                | 3.9     | 2.8     |
| 0.3008                     | 13.1                | 11.2    | 10.6    | 7.4                                               | 0.9     | -5.5    | 3.4                | 3.2     | 2.4     |
| 0.4259                     | 10.9                | 9.2     | 8.8     | 6.7                                               | 1.1     | -4.2    | 2.9                | 2.7     | 2.1     |
| 0.7017                     | 8.3                 | 6.9     | 6.6     | 5.4                                               | 1.1     | -2.8    | 2.2                | 2.1     | 1.7     |
| 0.9968                     | 6.8                 | 5.6     | 5.4     | 4.4                                               | 0.9     | -2.1    | 1.9                | 1.8     | 1.5     |
| 1.7486                     | 4.8                 | 3.9     | 4.0     | 3.0                                               | 0.7     | -1.3    | 1.5                | 1.5     | 1.3     |
| 5.6920                     | 2.5                 | 2.1     | 2.3     | 0.9                                               | 0.2     | -0.3    | 1.2                | 1.1     | 1.2     |
| 15.1258                    | 1.8                 | 1.5     | 1.8     | 0.0                                               | 0.0     | 0.1     | 1.3                | 1.1     | 1.3     |

REV. X1

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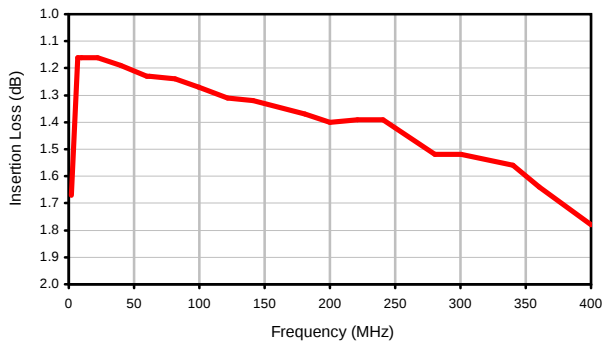


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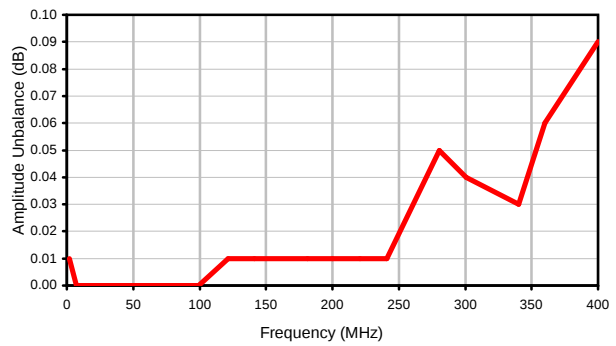


## Typical Performance Curves

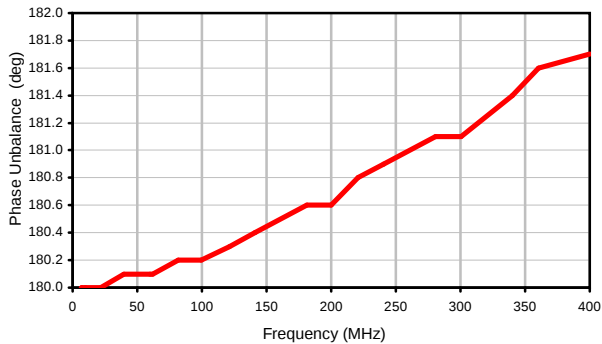
Insertion Loss @ 20 mA



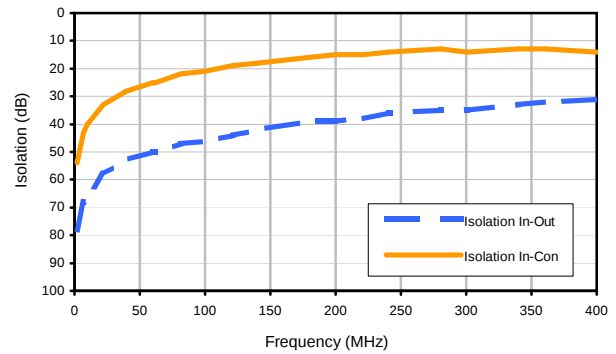
Amplitude Unbalance @  $\pm 20$  mA



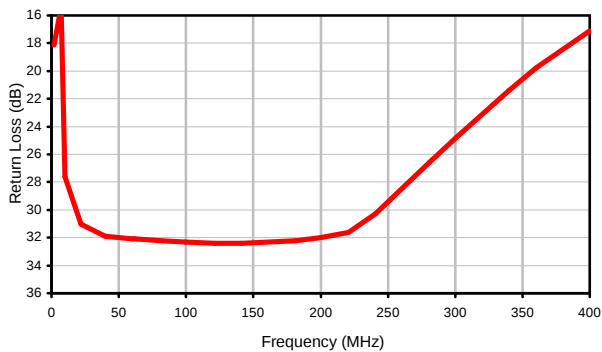
Phase Unbalance @  $\pm 20$  mA



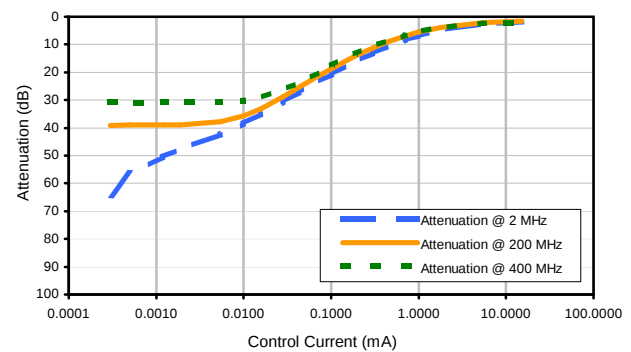
Isolation @ 0 mA



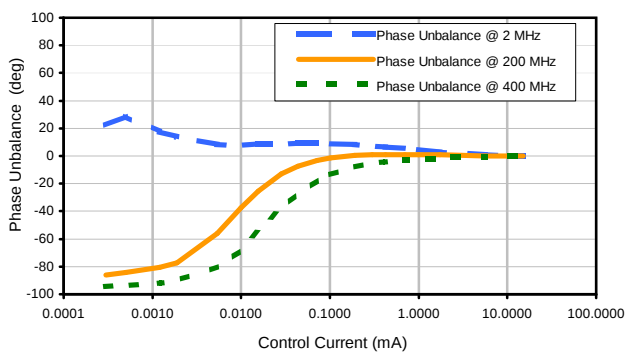
Return Loss Input



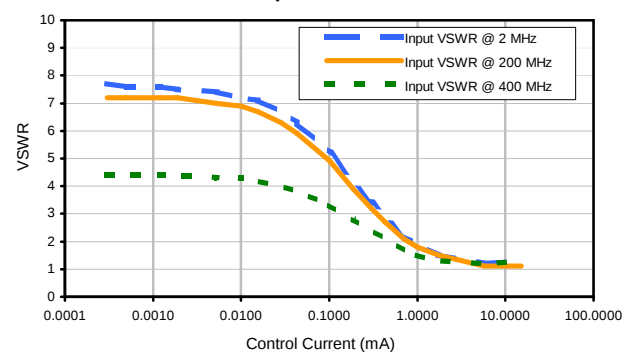
Attenuation



Phase Unbalance ref @ 15 mA



Input VSWR



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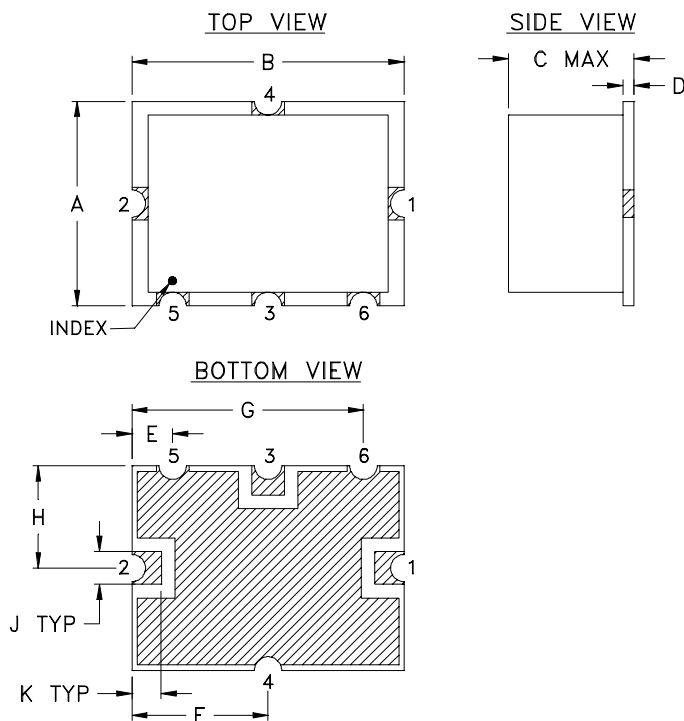


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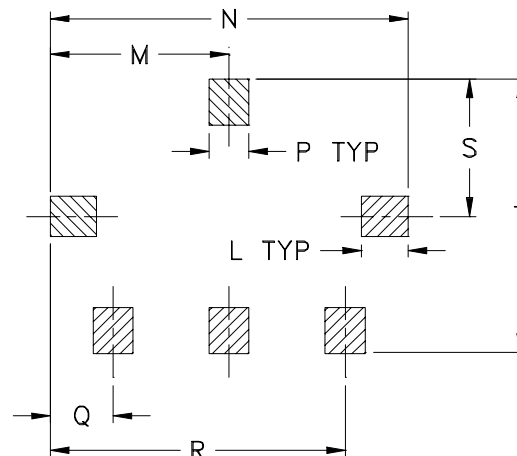


## Outline Dimensions

TTT166  
TTT167



## PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm .002$

| CASE # | A             | B              | C             | D              | E              | F              | G               | H              | J              | K              | L              | M              | N               |
|--------|---------------|----------------|---------------|----------------|----------------|----------------|-----------------|----------------|----------------|----------------|----------------|----------------|-----------------|
| TTT166 | .38<br>(9.65) | .50<br>(12.70) | .15<br>(3.81) | .020<br>(0.51) | .075<br>(1.91) | .250<br>(6.35) | .425<br>(10.80) | .187<br>(4.75) | .050<br>(1.27) | .050<br>(1.27) | .070<br>(1.78) | .270<br>(6.86) | .540<br>(13.72) |
| TTT167 |               |                | .23<br>(5.84) |                |                |                |                 |                |                |                |                |                |                 |

| CASE # | P              | Q              | R               | S              | T               | WT. GRAM |
|--------|----------------|----------------|-----------------|----------------|-----------------|----------|
| TTT166 | .060<br>(1.52) | .095<br>(2.41) | .445<br>(11.30) | .208<br>(5.28) | .415<br>(10.54) | .8       |
| TTT167 |                |                |                 |                |                 | .8       |

Dimensions are in inches (mm). Tolerances: 2 Pl.  $\pm .01$ ; 3 Pl.  $\pm .005$

### Note:

- Case material: Plastic.
- Base material: Printed wiring laminate.
- Termination finish:
  - For RoHS Case Styles: 3-5  $\mu$  inch (.08-.13 microns) Gold over 120-240  $\mu$  inch (3.05-6.10 microns) Nickel plate. All models, (+) suffix.
  - For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.

# Tape & Reel Packaging TR-F12



| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | Devices per Reel                    |     |
|----------------|-------------------------|-------------------|-------------------------------------|-----|
| 24             | 12                      | 7                 | Small quantity standards (see note) | 10  |
|                |                         |                   |                                     | 20  |
|                |                         |                   |                                     | 50  |
|                |                         |                   |                                     | 100 |
|                |                         |                   |                                     | 200 |
|                |                         | 13                | Standard                            | 500 |

Note: Please Consult individual model data sheet to determine device per reel availability.

Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

Go to: [www.minicircuits.com/pages/pdfs/tape.pdf](http://www.minicircuits.com/pages/pdfs/tape.pdf)



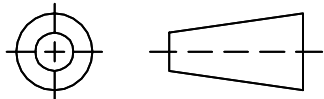
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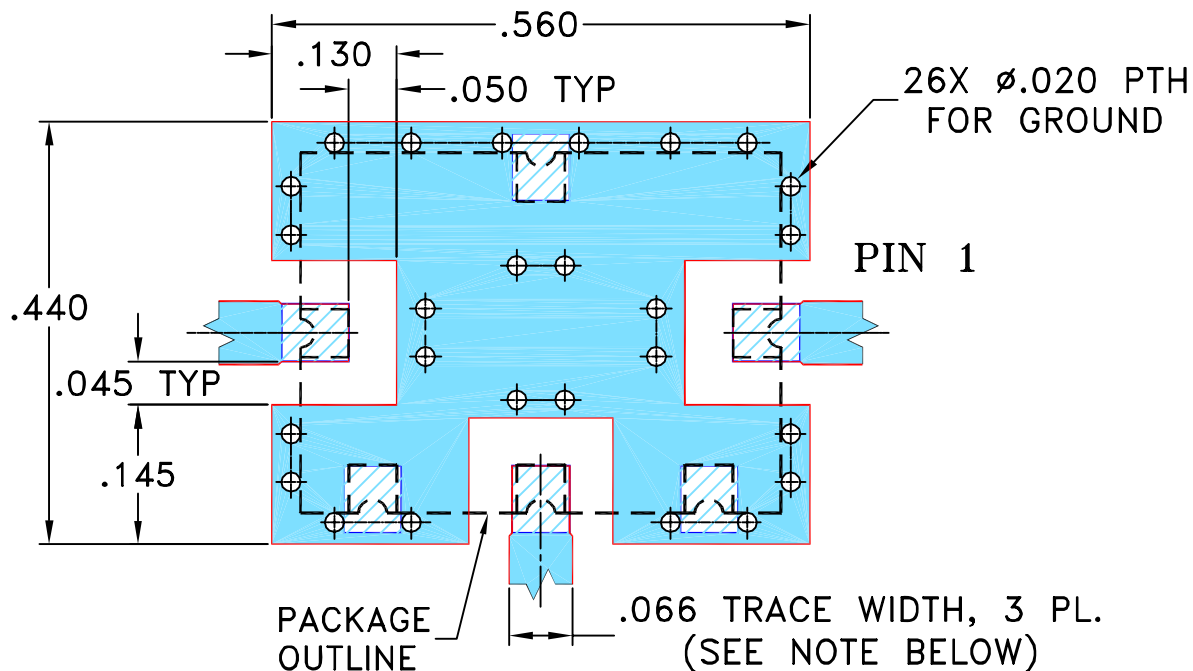
## THIRD ANGLE PROJECTION



## REVISIONS

| REV | ECN No. | DESCRIPTION                 | DATE     | DR  | AUTH |
|-----|---------|-----------------------------|----------|-----|------|
| A   | M86762  | ADDED CONNECTIONS "lp & lq" | 05/23/03 | MMG | WL   |
| B   | M94598  | ADDED CONNECTION "hk"       | 10/08/04 | MMG | HY   |
| C   | M102713 | UPDATED NOTES & DESCRIPTION | 01/14/06 | GF  | IL   |
| D   | M132989 | UPDATED NOTE 2              | 08/24/11 | GF  | DJ   |

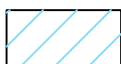
**SUGGESTED MOUNTING CONFIGURATION FOR  
TTT166/167 CASE STYLE, "hk"/"lp"/"lq"  
"x"/"ck"/"ec" PIN CONNECTIONS**

**NOTE:**

1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .030"  $\pm$  .002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. THE USE OF SOLDER MASK OVER THE GROUND AREA UNDER THE UNIT AS SHOWN IS RECOMMENDED TO PREVENT POTENTIAL SHORTING. IF USER CHOOSES TO EXPOSE METAL UNDER THE ENTIRE UNIT GROUND PAD FOR IMPROVED GROUNDING, IT IS RECOMMENDED A SOLDER MASK DAM BE APPLIED AROUND EACH GROUND PAD TO ENSURE FILLET AND CONNECTION AT GROUND PADS.
3. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.



DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER), SEE NOTE 2.



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED

INITIALS

DATE

DIMENSIONS ARE IN INCHES

TOLERANCES ON:

2 PL DECIMALS  $\pm$ 3 PL DECIMALS  $\pm$  .005ANGLES  $\pm$ FRACTIONS  $\pm$ 

DRAWN

GF

03/18/03

CHECKED

IL

04/15/03

APPROVED

DJ

04/15/03



**Mini-Circuits®**

13 Neptune Avenue  
Brooklyn NY 11235

PL, hk/lp/lq/x/ck/ec, TTT166/167,  
SYM/HJK/SYAS/SYPD, TB-12

SIZE  
A

CODE IDENT  
15542

DRAWING NO:  
98-PL-079

REV:  
D

FILE: 98PL079

SCALE: 5:1

SHEET: 1 OF 1

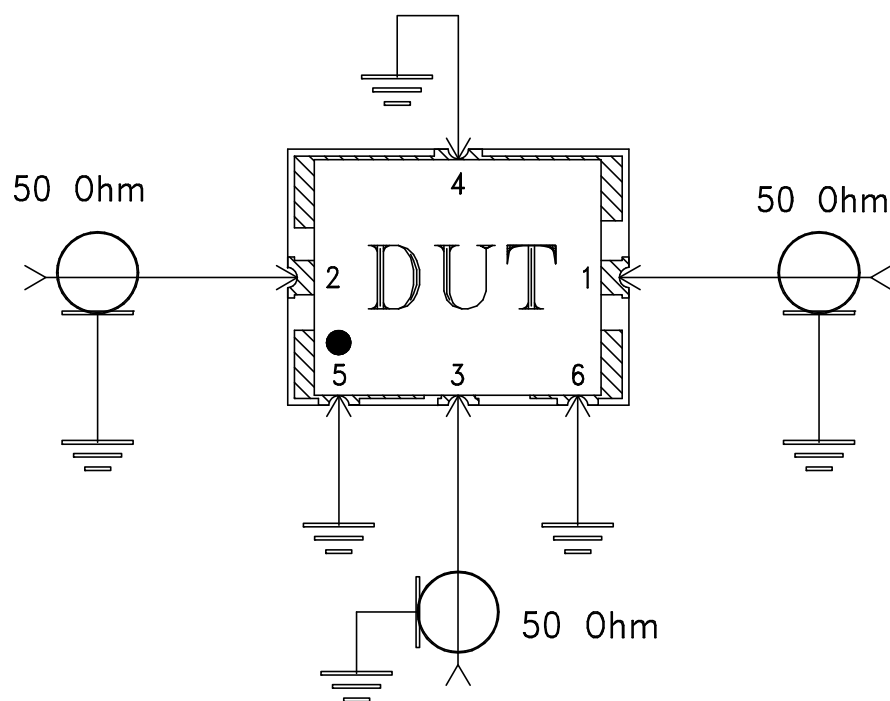
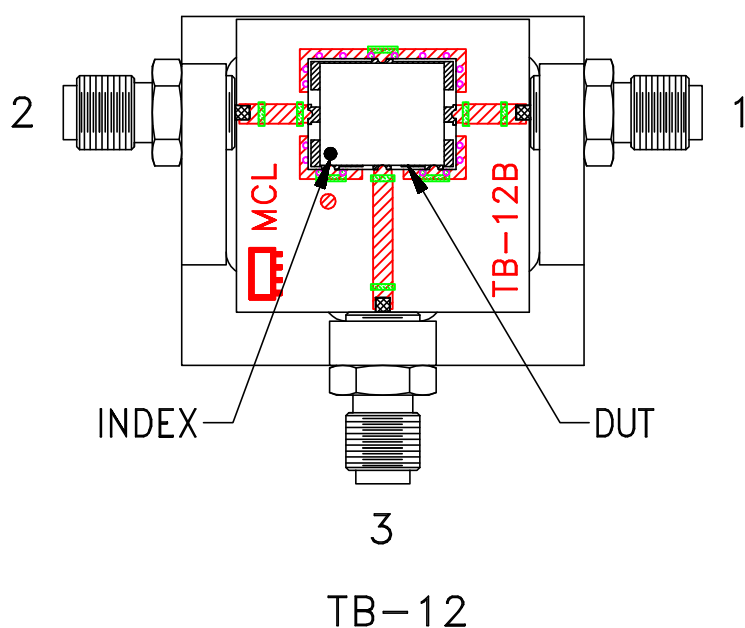
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ASHEETA1.DWG REV:A DATE:01/12/95

# Evaluation Board and Circuit

For Pin Connections Refer to Data Sheet of the DUT



Schematic Diagram

## Notes:

1. SMA Female connectors.
2. PCB Material: Rogers R04350 or equivalent, Dielectric Constant=3.5, Thickness=.030 inch.

 **Mini-Circuits®**



All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

| Specification                  | Test/Inspection Condition                                                                                                                                       | Reference/Spec                                                                                       |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| Operating Temperature          | -40° to 85°C<br>Ambient Environment                                                                                                                             | Individual Model Data Sheet                                                                          |
| Storage Temperature            | -55° to 100° C<br>Ambient Environment                                                                                                                           | Individual Model Data Sheet                                                                          |
| Humidity                       | 90 to 95% RH, 240 hours, 50°C                                                                                                                                   | MIL-STD-202, Method 103, Condition A, Except 50°C and end-point electrical test done within 12 hours |
| Thermal Shock                  | -55° to 100°C, 100 cycles                                                                                                                                       | MIL-STD-202, Method 107, Condition A-3, except +100°C                                                |
| Solder Reflow Heat             | Sn-Pb Eutetic Process: 225°C peak<br>Pb-Free Process 245° - 250°C peak                                                                                          | J-STD-020, Table 4-1, 4-2 and 5-2, Figure 5-1                                                        |
| Solderability                  | 10X Magnification                                                                                                                                               | J-STD-002, 95% Coverage                                                                              |
| Vibration (High Frequency)     | 20g peak, 10-2000 Hz, 12 times in each of three perpendicular directions (total 36)                                                                             | MIL-STD-202, Method 204, Condition D                                                                 |
| Mechanical Shock               | 50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes                                                                                               | MIL-STD-202, Method 213, Condition A                                                                 |
| Marking Resistance to Solvents | Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C;<br>distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C | MIL-STD-202, Method 215                                                                              |